AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A method of forming a copper damascene structure, said method comprising the steps of:

directly patterning a low-dielectric constant layer to form at least one opening through said low-dielectric constant layer;

forming a tungsten nitride layer by atomic-layer deposition using sequential surface reactions, said tungsten nitride layer being in contact with said at least one opening;

removing horizontal portions of said tungsten nitride layer formed above a surface of said low-dielectric constant layer by chemical mechanical polishing; and

subsequently providing a copper layer in said at least one opening and in contact with said tungsten nitride layer, wherein said copper layer is selectively deposited by low-temperature metal-organic chemical vapor deposition.

2. (Previously presented) The method of claim 1, wherein said low-dielectric constant layer includes a material selected from the group consisting of methylsilsequiazane, polyimide, spin-on-polymers, flare, polyarylethers, parylene, polytetrafluoroethylene, benzocyclobutene, fluorinated silicon oxide, and hydrogen silsesquioxane.

3. (Original) The method of claim 1, wherein said low-dielectric constant layer comprises methylsilsequiazane.

4. (Original) The method of claim 3, wherein said step of forming said at least one opening further comprises patterning said low-dielectric constant layer.

5. (Original) The method of claim 4, wherein said step of patterning said low-dielectric constant layer further comprises exposing said low-dielectric constant layer to an electron beam or ultra violet light.

6. (Original) The method of claim 5, wherein said step of forming said at least one opening further comprises etching said low-dielectric constant layer with a tetra-methyl-ammonium hydroxide solution.

7. (Original) The method of claim 3, wherein said low-dielectric constant layer is formed by spin coating to a thickness of about 2,000 to 50,000 Angstroms.

8. (Original) The method of claim 7, wherein said low-dielectric constant layer is formed by spin coating to a thickness of about 5,000 to 20,000 Angstroms.

9. (Original) The method of claim 1, wherein said tungsten nitride layer is formed at a temperature of about 550-800K.

10. (Canceled)

11. (Previously presented) The method of claim 1, wherein said copper layer is selectively deposited at a temperature of about 300°C to about 400°C.

12. (Original) The method of claim 11, wherein said copper layer is selectively deposited in an atmosphere of pure hydrogen from the β-diketonate precursor bis(6,6,7,8,8,8-heptafluoro-2,2-dimetyl 1-3,5-octanedino) copper (II).

13. (Original) The method of claim 11, wherein said copper layer is selectively deposited in an atmosphere of pure argon from the β-diketonate precursor bis(6,6,7,8,8,8-heptafluoro-2,2-dimetyl 1-3,5-octanedino) copper (II).

14. (Currently Amended) A method of forming a copper damascene structure, said method comprising the steps of:

directly patterning a low-dielectric constant layer with a mask to form at least one opening through said low-dielectric constant layer;

forming a tungsten nitride layer by atomic-layer deposition using sequential surface reactions, said tungsten nitride layer being in contact with said at least one opening;

removing horizontal portions of said tungsten nitride layer formed above a surface of said low-dielectric constant layer by chemical mechanical polishing; and

subsequently providing a copper layer in said at least one opening, wherein said copper layer is formed by contact displacement copper deposition at room temperature.

15. (Canceled)

16. (Original) The method of claim 1 further comprising the act of chemical mechanical polishing said copper layer.

17. (Previously Presented) A method of forming a copper damascene structure, said method comprising the steps of:

forming a material layer of methylsilsequiazane over a substrate;

forming at least one opening through said methylsilsequiazane layer by etching said methylsilsequiazane layer with a tetra-methyl-ammonium hydroxide solution;

forming a tungsten nitride layer by atomic-layer deposition using sequential surface reactions, said tungsten nitride layer being in contact with said at least one opening;

removing horizontal portions of said tungsten nitride layer formed above a surface of said methylsilsequiazane layer; and

subsequently providing a copper layer in said at least one opening.

18. (Original) The method of claim 17, wherein said step of forming said at least one opening further comprises directly patterning said methylsilsequiazane layer with a mask to form said at least one opening.

19. (Original) The method of claim 18, wherein said step of directly patterning said methylsilsequiazane layer further comprises exposing said methylsilsequiazane layer to an electron beam or ultra violet light.

20. (Canceled)

21. (Original) The method of claim 17, wherein said methylsilsequiazane layer is formed by spin coating to a thickness of about 2,000 to 50,000 Angstroms.

22. (Original) The method of claim 21, wherein said methylsilsequiazane layer is formed by spin coating to a thickness of about 5,000 to 20,000 Angstroms.

23. (Original) The method of claim 17, wherein said tungsten nitride layer is formed at a temperature of about 550-800K.

24. (Original) The method of claim 17, wherein said copper layer is selectively deposited by chemical vapor deposition.

25. (Original) The method of claim 24, wherein said copper layer is selectively deposited at a temperature of about 300°C to about 400°C.

26. (Original) The method of claim 25, wherein said copper layer is selectively deposited in an atmosphere of pure hydrogen from the β-diketonate precursor bis(6,6,7,8,8,8-heptafluoro-2,2-dimetyl 1-3,5-octanedino) copper (II).

27. (Original) The method of claim 25, wherein said copper layer is selectively deposited in an atmosphere of pure argon from the β-diketonate precursor bis(6,6,7,8,8,8-heptafluoro-2,2-dimetyl 1-3,5-octanedino) copper (II).

28. (Original) The method of claim 17, wherein said copper layer is formed by electroless deposition.

29. (Original) The method of claim 17 further comprising the act of chemical mechanical polishing said tungsten nitride layer.

30. (Original) The method of claim 17 further comprising the act of chemical mechanical polishing said copper layer.

Claims 31-45. (Canceled)